

THAT WHICH IS CLAIMED:

1. A human intervertebral disc cell culture comprising human intervertebral disc cells embedded in a carrier material forming a three-dimensional structure, wherein said human intervertebral disc cells are capable of proliferating within said three-dimensional structure.

2. The human intervertebral disc cell culture of Claim 1, wherein said carrier material is selected from the group consisting of alginate, agarose, collagen, and derivatives and mixtures thereof.

3. The human intervertebral disc cell culture of Claim 1, wherein said human intervertebral disc cells are capable of re-expressing extracellular matrix materials.

4. The human intervertebral disc cell culture of Claim 1, further comprising cell culture medium in intimate contact with said three-dimensional structure.

5. The human intervertebral disc cell culture of Claim 1, wherein said three-dimensional structure is placed in a cell well insert.

6. The human intervertebral disc cell culture of Claim 1, wherein said human intervertebral disc cell culture is prepared by a method comprising the steps of:

a) providing a minced human intervertebral disc tissue explant comprising human intervertebral disc cells;

b) culturing said minced explant under conditions to propagate and form a monolayer of human intervertebral disc cells, wherein the human intervertebral disc cells of said monolayer can be isolated and further propagated upon passaging;

c) isolating said human intervertebral disc cells from said monolayer;

d) seeding the isolated cells in a carrier material such that the isolated cells are dispersed and distributed in the carrier thereby forming a three-dimensional structure; and

e) culturing said dispersed and distributed cells in the three-dimensional structure.

5 7. A human intervertebral disc cell culture comprising human intervertebral disc cells embedded in a carrier material forming a three-dimensional structure, wherein at least a portion of said human intervertebral disc cells are produced by cell proliferation within said three-dimensional structure.

10 8. The human intervertebral disc cell culture of Claim 7, wherein said carrier material is selected from the group consisting of alginate, agarose, collagen, and derivatives and mixtures thereof.

15 9. The human intervertebral disc cell culture of Claim 7, wherein at least a portion of said human intervertebral disc cells have re-expressed extracellular matrix materials.

20 10. A therapeutic composition for use in treating human disc diseases comprising an implantation carrier in admixture with *in vitro* propagated human intervertebral disc cells, said disc cells being obtain from a monolayer human intervertebral disc cell culture prepared by a method comprising the steps of:

25 a) providing a minced human intervertebral disc tissue explant comprising human intervertebral disc cells; and  
b) culturing said minced explant under conditions to propagate and form a monolayer of human intervertebral disc cells, wherein the human intervertebral disc cells of said monolayer can be isolated and further propagated upon passaging.

30 11. The therapeutic composition of Claim 10, wherein said implantation carrier comprises alginate, agarose, collagen, or a derivative or mixture thereof.

12. The therapeutic composition of Claim 10, wherein said

implantation carrier is in the form of hydrogel.

13. The therapeutic composition of Claim 10, wherein said implantation carrier is in the form of a three-dimensional assembly.

14. A therapeutic composition for use in treating human disc diseases comprising an implantation carrier in admixture with *in vitro* propagated human intervertebral disc cells, said disc cells being obtain from a three-dimensional human intervertebral disc cell culture prepared by a method comprising the steps of:

- a) providing a minced human intervertebral disc tissue explant comprising human intervertebral disc cells;
- b) culturing said minced explant under conditions to propagate and form a monolayer of human intervertebral disc cells, wherein the human intervertebral disc cells of said monolayer can be isolated and further propagated upon passaging;
- c) isolating the human intervertebral disc cells from said monolayer;
- d) seeding the isolated cells in a carrier material such that the isolated cells are dispersed and distributed in the carrier material forming a three-dimensional structure; and
- e) culturing said dispersed and distributed cells in the three-dimensional structure.

15. The therapeutic composition of Claim 14, wherein said implantation carrier comprises alginate, agarose, collagen, or a derivative or mixture thereof.

16. The therapeutic composition of Claim 14, wherein said implantation carrier is in the form of hydrogel.

17. The therapeutic composition of Claim 14, wherein said implantation carrier is in the form of a three-dimensional assembly.

18. The therapeutic composition of Claim 14, wherein at least a portion of said *in vitro* propagated human intervertebral disc cells have re-expressed extracellular matrix materials.

5 19. A method for treating an intervertebral disc disease in a human patient, comprising implanting *in vitro* propagated human intervertebral disc cells into a target disc area needing treatment in said human patient.

10 20. The method of Claim 19, wherein said *in vitro* propagated human intervertebral disc cells are provided by a process including the steps of:

a) obtaining a healthy human intervertebral disc tissue;  
b) mincing said human intervertebral disc tissue to obtain a minced explant comprising human intervertebral disc cells; and

15 c) culturing said minced explant under conditions to propagate and form a monolayer culture of human intervertebral disc cells, wherein the human intervertebral disc cells of said monolayer can be isolated and further propagated upon passaging.

20 21. The method of Claim 20, wherein said disc specimen is obtained from said human patient to be treated.

22. The method of Claim 20, wherein said minced explant in step(c) is anchored by a plastic mesh.

25 23. The method of Claim 20, wherein said minced explant is cultured in the presence of serum, growth factors or cytokines.

24. The method of claim 20, wherein said minced explant is cultured in the presence of transforming growth factor beta (TGF- $\beta$ ).

30 25. The method of Claim 20, wherein said process further include *in vitro* propagated human intervertebral disc cells are provided by a process including the

steps of:

a) providing said human intervertebral disc tissue to obtain a minced explant comprising human intervertebral disc cells;

b) culturing said minced explant under conditions to propagate and form a monolayer of human intervertebral disc cells, wherein the human intervertebral disc cells of said monolayer can be isolated and further propagated upon passaging;

c) isolating said human intervertebral disc cells from said monolayer;

d) seeding the isolated cells in a carrier material such that the isolated cells are dispersed and distributed in the carrier material forming a three-dimensional structure;

and

e) culturing said dispersed and distributed cells in the three-dimensional structure.

26. The method of Claim 25, wherein said disc specimen is obtained from said human patient to be treated.

27. The method of claim 25, wherein said minced explant in step (b) is anchored by a plastic mesh.

28. The method of claim 25, wherein said three-dimensional structure is formed in a cell well insert.

29. The method of claim 25, wherein said carrier material is selected from the group consisting of alginate, agarose, collagen, and derivatives and mixtures thereof.

30. The method of Claim 25, wherein said three-dimensional structure is formed in a cell well insert.

31. The method of Claim 25, wherein said three-dimensional structure is implanted into the target disc area.

32. The method of Claim 19, wherein at least a portion of said *in vitro* propagated human intervertebral disc cells have re-expressed extracellular matrix materials.

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33. The method of Claim 19, wherein said *in vitro* propagated human intervertebral disc cells are implanted in an implantation carrier.

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34. The method of Claim 19, wherein said implanting step comprises: debriding diseased or injured disc tissue in said patient; and delivering said *in vitro* propagated human intervertebral disc cells into the area of debridement.

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